Magnetite Exsolution and Associated Changes of Stoiciometry in Fe_xO at High Pressure and Temperature: Preliminary Study from a Combined CCD/IP Detection System for Monochromatic XRD Studies *	X17B1

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Wustite (Fe_xO) is one of the classic examples of highly nonstoichiometric materials that have been receiving considerable attention as model materials for elucidation of defect structure, the nature of interaction between defects, and effect of nonstoichiometry on the physical properties. The physical properties of these materials, such as thermal expansion, magnetic properties, cation diffusion, and dependence of stoichiometry on the equilibrium oxygen pressure, have been found to be closely related to composition and state of the defect structure. Taking thermal expansion as an example, because the arrangement of defect clusters and the extent of magnetite exsolution may adjust to changes in temperature, the experimentally determined values of thermal expansion may include volume changes from both bond expansion and a continuous structural variation.

At both atmospheric and high pressures, wustite (Fe_xO) tends to exsolve magnetite (Fe_3O_4) on slow cooling when temperature was below 849 K. In the presence of magnetite, the composition of the coexisting wustite approaches ideal or near-ideal stoichiometry, following a kinetically-controlled reaction $Fe_xO \rightarrow Fe_yO + Fe_3O_4$, with y > x [Greenwood and Howe, J. Chem. Soc. Dalton Trans. 1, 116, 1972]. The changes in the defect concentrations of Fe_xO that are associated with this reaction and possibly with temperature were studied at high pressures in the range 300-1073 K using a combined CCD/IP detection system for monochromatic XRD studies.

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